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ORIGINAL ARTICLE

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The effects of collective bargaining systems on the productivity function of firms: An analysis of bargaining structures and processes and the implications for policy making

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Abstract

In recent years, individual and company bargaining have increasingly supplanted sector and country collective bargaining leading to increasingly heterogeneous and perforated, that is, hybrid, national collective bargaining systems. Little is known about the relative effects of these different systems. In this paper, the authors derive and test a comprehensive categorization of collective bargaining systems and argue that different systems are associated with different production functions and therefore have different effects on labour productivity. The hypotheses are tested using representative workplace-level data for all member states of the European Union. It is found that the performance of coordinated sector collective bargaining systems is higher than for all other forms of collective and individual bargaining. Policy implications of the results are discussed as these results challenge attempts to reform collective bargaining in Europe.

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1 | INTRODUCTION

Interest in the effects, that is, the functioning and impact, of different *collective bargaining systems*, that is, different institutional structures and processes of collective bargaining, on the productivity of companies has (re)gained both political and academic interest in recent years. This interest was triggered by the advent of the economic crisis in 2008, because the ability of some forms and structures of collective bargaining to provide flexibility for companies to maintain or increase their productivity and competitiveness was questioned in some countries.

Particularly in the European Union (EU), *political interest* in the effects of collective bargaining systems increased after the adoption of the Europe 2020 strategy in 2010, which aims at promoting 'smart, sustainable and inclusive growth' for the EU member states. A part of this strategy aims at fostering the productivity of European companies to enable them to compete successfully in the world market. Although Europe 2020 does not directly refer to collective bargaining, several countries received recommendations to review their bargaining systems to ensure that labour costs, that is, wages and working time arrangements, *support competitiveness and productivity growth* (European Commission, 2011). Furthermore, political interest in the effects of collective bargaining increased in recent years after the European Commission, the European Central Bank (ECB) and the International Monetary Fund (IMF) included reforms of collective bargaining systems on the agenda of their Memoranda of Understandings (Johnston, 2016; Marginson, 2015; Zartaloudis & Kornelakis, 2017).

In *academia interest* increased as in many European countries, 'well-known' *national* collective bargaining systems, which were characteristic of European countries for the second half of the 20th century (Crouch, 1993; European Commission, 2015), transformed into hybrid systems (Brandl & Bechter, 2019), that is, into perforated, multilayered and complex systems of collective bargaining (Ebbinghaus, 2004; Keller, 2018; Marginson, 2015). From a national, that is, countrywide, perspective, these new systems of collective bargaining are certainly not homogeneous and uniform for all (or the majority) of companies in the economy but characterized by the presence of different collective agreements, for example, sectoral, and company agreements, within one country (Marginson & Sisson, 2002). However, little is known about the relative effects of these systems of collective bargaining for companies in this recently emerged environment.

Against this background, we provide a generalizable, comprehensive and in-depth investigation of the relationship between distinct collective bargaining systems and company performance using cross-European microdata on the workplace level. Specifically, we contribute to recently emerged microstudies and debates on the relationship between different industrial relations factors including collective bargaining systems and company performance (Askenazy et al., 2016; Braakmann & Brandl, 2021; Boeri, 2014; Forth et al., 2017; Organisation for Economic Co-operation and Development [OECD], 2019). These recent debates do not focus anymore on data and cases in a small number of countries with very limited institutional variety in industrial relations but are able to provide generalizable insights into the relationship between different aspects of industrial relations and company performance. Within these recent debates, which investigated a number of industrial relations factors, we concentrate and take a more detailed look at the role of different collective bargaining systems. More specifically, we augment current discussions by widening the analysis by investigating the degree of coordination between different bargaining units at the same or between different levels. Similar to very recent investigations that also emphasized the important role of coordination of collective bargaining (OECD, 2019), we contribute to these debates by augmenting the analysis by a more

detailed investigation of the fact that because of the hybridization of national collective bargaining systems in recent years, different bargaining institutions might apply for companies. Theoretically, we contribute to these current debates by developing the argumentation that different collective bargaining systems are associated with different production functions and therefore have different effects on company the performance.

As regards the conceptualization and operationalization of company performance, we will concentrate on labour productivity, which also became increasingly used in current debates (Askenazy et al., 2016; Braakmann & Brandl, 2021; Forth et al., 2017; OECD, 2019). Using productivity in our analysis of the effects or performance of collective bargaining systems is advantageous compared with other indicators such as wage indicators. Wage indicators, which are often the 'standard' indicator in debates (Calmfors & Driffill, 1988; Flanagan, 1999) are not necessarily a valid performance indicator for the performance of collective bargaining since they are not covering the full range and scope of effects of collective bargaining systems. As will be explained, collective bargaining is not exclusively about wages but also about many nonwage issues (i.e., working conditions), which all matter for the performance of companies.

The article is organized into seven parts. In the following section, we outline the analytical framework in which we present our classification of different collective bargaining systems and define our key concepts. We then review the relevant literature on the effects of collective bargaining systems and derive our arguments and hypotheses. Afterwards, we present the data, methodology and our modelling strategy, which is followed by a section in which we present the empirical results of the tests of our models. We then discuss the results in the light of previous literature and finally conclude by outlining the implications of our study in the context of attempts to reform collective bargaining in the EU.

2 | ANALYTICAL FRAMEWORK

The EU member states differ substantially with respect to their institutional structures and processes of how wages and working conditions are set, that is, regarding their collective bargaining systems. This implies that companies in different countries are confronted with different collective bargaining systems and have different options, if they have an option at all, to choose how wages and working conditions are set for them. The reason why companies are embedded in different system can be found in different histories, cultures and social norms in which companies are embedded (Aumayr-Pintar et al., 2014; Crouch, 1993; Johnston, 2016; Ramskogler, 2013).

As regards the main differences between collective bargaining systems. First, countries differ in the 'traditional' and dominant *level* of collective bargaining, that is, whether the majority of covered employees fall under company (decentralized), sector (intermediate) or even national (centralized) collective agreements. The latter two levels are also defined as higher level collective agreements. Second, countries also differ with respect to the degree of horizontal and vertical *coordination* of collective bargaining in cases where different bargaining units exist. We refer to horizontal coordination when looking at the interaction between bargaining units at the same level and use vertical coordination in the case of multilevel bargaining systems to describe the interaction between units at different levels.

Empirically and conceptually, any classification of countries on basis of the incidence and degree of horizontal and vertical coordination of collective bargaining is challenging because very different formal and informal institutional mechanisms need to be considered and

operationalized. Therefore, different empirical and conceptual approaches can be applied, which can lead to different categorizations, which is reflected in literature (Aumayr-Pintar et al., 2014; Garnero, 2020; OECD, 2019; Traxler et al., 2001). In this work, we use the conceptualization of both horizontal and vertical coordination by Traxler et al. (2001) for which Aumayr-Pintar et al. (2014) provide the updated data. Thus, the data on coordination are not based on any items in the ECS.

More specifically, the conceptualization of *horizontal coordination* by Traxler et al. (2001) differentiates between countries' bargaining systems on the basis of the legal, associational, formal and informal framework of collective bargaining regarding the ability to coordinate the outcome of bargaining by different units at the same level. The reason for using this conceptualization is that it clearly distinguishes between the horizontal and vertical dimensions, which is the focus of this paper even though more differentiations on the degree of coordination are available (Garnero, 2020; OECD, 2019) but which would detour from the focus of the paper. More specifically, in this work, the classification of countries' collective bargaining systems as horizontally coordinated or uncoordinated is based on the existence of any form of integrative interaction between units and could be either in terms of formal cooperation meetings or via informal norms, such as pattern bargaining, that is, sectoral wage leadership. As regards the latter, the idea of pattern bargaining is that a sector sets the targets by setting wages and working conditions first and others follow and set wages and working conditions in a similar way (OECD, 2019; Traxler et al., 2008). Usually, a sector, which is exposed to international competition, takes over the role as leading sector, which has the effect that productivity and performance criteria are at the forefront in wage and working condition setting because companies in the exposed sector need to maintain or even increase their competitiveness. Because other sectors follow this logic in wage and working condition setting, positive performance and productivity effects for other sectors and even the whole economy are guaranteed, which is also shown in literature (Brandl, 2012; OECD, 2019; Traxler et al., 2008). However, as countries' collective bargaining systems differ in many ways, both the formal and informal institutional and procedural coordination mechanisms, that is, also the way how pattern bargaining works in detail, differ between countries (OECD, 2019), but by using the above conceptualization, horizontal coordination is observable more or less prominently in countries such as Austria, Belgium, Denmark, Finland, Germany, the Netherlands and Sweden (Aumayr-Pintar et al., 2014).

Our conceptualization of *vertical coordination* follows Traxler et al. (2001) who define and differentiate bargaining systems on the basis of the legal, associational, formal and informal framework of collective bargaining regarding the ability to govern and influence the outcome of bargaining by different units at different levels. More specifically, countries' collective bargaining systems with a high degree of vertical coordination are characterized by the ability of higher level bargaining units, usually peak and central-level employers' organizations and trade unions, to impose restrictions and rules on the outcome and topics (i.e., on wages and working conditions) of lower level bargaining. We also consider a system to be vertically coordinated when there is 'top down', that is, 'top-level' state intervention in bargaining. Thus, similar to the horizontal coordination, countries differ in the institutional form, processes and scope of vertical coordination. As for the classification of countries' collective bargaining system for the existence of horizontal coordination, we also base our classification of the existence of vertical coordination on Aumayr-Pintar et al. (2014) and Traxler et al. (2001) who define a countries' collective bargaining system as vertically coordinated if there is some form of integrative interaction, governance or compliance between units at different levels. Empirically, these exist again in a country specific form, which may be more or less accentuated (Aumayr-Pintar

et al., 2014) in Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Sweden and Slovenia. Table 1 provides an overview of the classification of countries according to the incidence of horizontal and vertical collective bargaining.

As can be seen in Table 1, the incidence of both horizontally and vertically coordinated collective bargaining systems can be found only in a limited number of countries in the EU, and it is evident that usually if there is some form of vertical coordination of bargaining in a country, there is also some form of horizontal coordination (and vice versa). For an overview of the integrative interaction of collective bargaining units and the respective country classification outlined here and used in the analysis and for more information on the mechanisms, see Aumayr-Pintar et al. (2014) and Traxler et al. (2001). However, it can also be seen that this classification of countries overlaps with conceptualizations and country categorizations of the degree of collective bargaining from similar studies (Garnero, 2020; OECD, 2019). In order to test the robustness of the classification of countries, robustness tests have been made in which borderline countries were included or excluded. The robustness test confirmed the results shown in the analysis.

3 | HYPOTHESES: THE EFFECTS AND PERFORMANCE OF DIFFERENT SYSTEMS OF COLLECTIVE BARGAINING

A major focus in the literature on collective bargaining has been the effects of differences in collective bargaining systems on socio-economic aggregates, which are often described as ‘performance’ indicators (Calmfors & Driffill, 1988; Flanagan, 1999). The key issues in these theoretical and empirical discussions have usually centred on how cost effective different systems of collective bargaining are, which ‘voice’ effects on the behaviour of employees are produced, which then translate into differences in company performance (Freeman & Medoff, 1984) and which restrictions are imposed on managements’ prerogatives and companies’ flexibility to set wages and working conditions freely (Hirsch & Link, 1984). In addition, research has considered the ability and extent of different collective bargaining units to simply maximize their rent and even pursue a beggar-thy-neighbour collective bargaining strategy or not, or to take the long-term mutual interests of and the effects for both sides in the employment relationship as well as outside their domain, for example, for the whole economy and society, into account for the bargaining outcome (Soskice, 1990).

TABLE 1 Horizontal and vertical collective bargaining: Classification of countries

		Horizontal	
		Low	High
Vertical	Low	Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Spain, the United Kingdom	
	High	Luxembourg, Slovenia	Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands, Sweden

Although previous literature has concentrated strongly on wage indicators as performance measure, we prefer changes to labour productivity for two conceptual and methodological reasons (Braakmann & Brandl, 2021): first, because collective bargaining is not exclusively about wages but also about working conditions including working time, remuneration forms and schemes, innovation and organizational change regulations, as well as vocational training agreements. All these nonwage issues not only are usually an integral part of the bargaining process but also affect labour productivity and therefore the performance of companies (Heyes & Lewis, 2014). Second, what is ultimately relevant for the performance and success of companies is their productivity development and not necessarily the development of their employees' wages. In fact, the productivity of companies might even increase because of high (efficiency) wages (Lazear, 1995). Therefore, we derive hypotheses on the relationship between different systems of collective bargaining and changes in productivity.

Basically, we will argue that the relationship between collective bargaining and changes in labour productivity is based on the reasoning that different collective bargaining systems are associated with different effects on the use of production factors, that is, on the use of the production factor labour. In other words, we will argue that different systems of collective bargaining are associated with different production functions and therefore have different effects on the development of labour productivity. However, as will be explained, this basic causal link between different collective bargaining systems and changes in labour productivity is potentially mediated by changes in company practices.

Specifically, we argue that differences in collective bargaining systems have an effect on changes in labour productivity as different systems entail different degrees in the range and encompassment of collective agreements, which define standardized and homogeneous wages and working conditions. The higher the level of collective bargaining, the wider the range and encompassment of collective agreements and therefore the wider the range and encompassment in the standardization of wages and working conditions.

The implications of standardized wages and working conditions in a wider domain, for example, for a sector, are that companies are limited in their flexibility to use wages and working conditions as a tool to improve their competitiveness, that is, their productivity. For example, it is not possible for a company to gain a relative advantage by 'simply' lowering wage costs. On the one hand, this effect of collective bargaining certainly limits companies' flexibility and managements' prerogatives to adjust and adapt to some labour and product market changes and therefore might cause inefficiencies and labour market distortions (Hirsch & Link, 1984). On the other hand, it means that adjustments to labour and product market fluctuations need to be addressed by other means such as by the use of the production factor labour. More specifically, this means that companies need to adjust by changes in working processes and practices, for example, by changing remuneration practices in order to motivate employees more or by restructuring the organization and fostering teamwork. Such adjustment processes in different companies and different sectors and the impact on productivity were clearly identified and shown in recent years (Askenazy et al., 2016; Bryson & Forth, 2015).

In fact, there is evidence that wide-ranging and encompassing (sector or countrywide) collective agreements or other labour market 'restrictions', such as, for example, statutory minimum wages, create strong incentives for management to change and improve working and management practices (Bloom et al., 2017) and working and production processes (Wachsen & Blind, 2016) and thus provide strong incentives for a change in the production function. Moreover, it can be argued that without the standardization of (minimum standards) on wages and working conditions, beneficial long(er)-term organizational and technological change is

hindered (Doucouliagos & Laroche, 2003). Especially in an environment in which management is focused on short-term profits and productivity, it might be easier to adjust to business cycle fluctuations via adjustments in wages rather than via changes in the production function, which might imply the need for higher managerial competencies and skills (Askenazy et al., 2016; Bloom et al., 2017; Forth et al., 2017). In any case, wide-ranging and encompassing standardized (minimum) wages and working conditions have the effect that changes in the production function are encouraged and companies that are not able to adapt their production function are increasingly 'pushed out' of the market.

The above reasoning implies that we can expect higher level collective bargaining systems to be associated with different production functions and therefore different developments in productivity than all other systems. Against the background that the long-term effects of changes in the use of the factor labour by changing and improving working processes and practices constitute a competitive advantage for companies in the longer run (Askenazy et al., 2016; Bloom et al., 2017; Bryson & Forth, 2015; Doucouliagos & Laroche, 2003; Willman, 1986) compared with companies that are able to maintain their productivity on the basis of adjusting wages and working conditions, we expect companies that are affected by higher level collective agreements to be associated with a higher incidence of increases in labour productivity compared with companies that are affected by a company or no collective agreement.

Even though we expect higher level collective bargaining systems to be associated with a beneficial performance in terms of the incidence of increases in labour productivity, we also expect that this effect is contingent on the horizontal and vertical coordination of collective bargaining. The reason why coordination is argued to make a difference is that only coordinated collective bargaining systems ensure an encompassing standardization of wages and working conditions. Uncoordinated collective bargaining systems might not be sufficient for encompassment of collective agreements or comprise 'loopholes', which potentially undermine encompassing standardization of wages and working conditions.

As regards the horizontal dimension, uncoordinated collective bargaining might not suffice to guarantee encompassment as different units (sectors) might deviate in wages and working conditions considerably. Moreover, some units might have incentives to set wages and working conditions in a way, which fulfils the unit's own (short-term) interests, but the outcome is not necessarily in the (mutual) interest of other units or even has negative effects (externalities) on other units. This is one of the main arguments behind the prominent hump-shape thesis (Calmfors & Driffill, 1988). Thus, horizontally *uncoordinated* bargaining systems might even lead to labour market distortions. Vertically uncoordinated systems also might not suffice to guarantee encompassment as lower level units might deviate, bypass and offset the standardized wages and working conditions of higher level agreements. This is not the case for coordinated systems where there is compliance of lower level units (Soskice, 1990). Therefore, we expect that only workplaces that are affected by horizontally and vertically coordinated collective bargaining systems to be associated with a higher incidence of increases in labour productivity compared with companies that are embedded in all other collective bargaining systems or do not fall under any collective agreement.

Furthermore, we expect vertically coordinated collective bargaining systems to have additional beneficial effects on the ability of companies to maintain or increase their productivity as they enable integrative and coordinated company-specific flexibility adoptions, which are in the mutual interest of the larger domain and therefore do not 'harm' other units or companies (Traxler, 1995). Such flexibility arrangements within coordinated bargaining systems are often

agreements and 'internal' adjustments to working time to buffer fluctuations on the labour and product market (Askenazy et al., 2016).

The upshot of the above reasoning on the expected relationship between different collective bargaining systems and developments in labour productivity is that we are able to hypothesize that companies that fall under a collective agreement, which is based on bargaining between the employee and employer side within a framework of (horizontally) coordinated higher level bargaining or within (vertically) coordinated multilevel bargaining, are likely to be associated with higher incidences of labour productivity increases. Against the background that vertically coordinated collective bargaining system also enable flexible and tailored adjustments that are in the long-term interest of the economy or society as compared with the short-term flexibility demands and needs of companies, we hypothesize the positive effects on productivity for these systems to be relatively highest.

4 | DATA, MODELLING STRATEGY AND METHODOLOGY

4.1 | Data

As stated earlier, we are investigating and estimating the relationship between collective bargaining systems and workplaces' changes to labour productivity. Therefore, we require data on both productivity changes and collective bargaining systems at the level of individual workplaces. As part of the variation in collective bargaining systems, specifically the degree of horizontal and vertical coordination, is based on national differences, we also integrate cross-country-level information. As regards data at workplace level, we use the 2009 and 2013 waves of the European Company Survey (ECS) (see Eurofound, 2010, 2015). The ECS collects company/workplace-level, that is, firm-level, data on employment relations and human resource management issues in all member states of the EU based on interviews with human resource managers and employee representatives.

The ECS data are representative for businesses and organizations with 10 or more employees and contain detailed information about coverage by higher level, that is, national or sectoral, and company-level collective agreements for each workplace. For national-level data, that is, for data on the horizontal and vertical coordination of collective bargaining, we use the classification of coordinated and uncoordinated countries from Aumayr-Pintar et al. (2014).

On the basis of these data, we are able to differentiate between the following five systems of collective bargaining: company bargaining, horizontally coordinated (higher level) bargaining, horizontally uncoordinated bargaining, vertically coordinated (multilevel) bargaining and vertically uncoordinated (multilevel) bargaining. These categories of collective bargaining systems cover all companies in our sample in which employees fall under a collective agreement. All other companies in our sample are characterized by the absence of any collective agreement. The latter category, that is, purely individual bargaining between the employer and employee or no collective bargaining, will be used as our reference category in all of the following analyses.

As an outcome indicator for the effect, that is, performance, of collective bargaining systems, we use changes in labour productivity in the past 3 years, measured in three categories, 'increased', 'decreased' and 'remained the same'. Although our outcome indicator is essentially based on a subjective assessment of a workplace's situation, the question is posed to senior managers who have information on the financial situation and development of the workplace and

oversee personnel (including labour costs), which attenuates potential concerns about the validity and reliability of the data (Forth et al., 2010; Kersley et al., 2005). Descriptive statistics are shown in Table 2.

4.2 | Modelling strategy

We begin our analysis on the relationship between different collective bargaining systems and increases in companies', that is, workplaces', labour productivity by investigating the unconditional differences in the probability of increases in labour productivity by collective bargaining systems using probit regressions. More specifically, we start the investigation of the relationship on the basis of a parsimonious model that does not include (control) variables. For ease of interpretation, we will report average marginal effects, that is, the average change in probability for an increase in labour productivity following a one-unit change in the right-hand side variable. As some features of collective bargaining systems vary only at the country level, that is, the coordination of collective bargaining, we adjust all standard errors for potential clustering on this level. Where possible, we weigh estimates using employee-proportional weights. As stated earlier, we expect any link between collective bargaining and labour productivity to arise through some link with workers. If this is the case, it seems appropriate to place more weight on larger workplaces—productivity increases in these imply that a larger number of employees have individually changed their behaviour. Using either no weights or workplace-proportional weights leads to very similar results, albeit with some small changes to statistical significance on individual coefficients.

In the next step, we inspect the results of this parsimonious model further by including control variables that potentially influence the results and are potentially linked to the adoption of specific collective bargaining systems. Therefore, we subsequently condition on a range of potential confounders, specifically, sector dummies (including a public/private sector differentiation) and workplace and staff characteristics such as workplace size, dummies for being a company headquarter or a subsidiary site and the proportions of employees with open-ended contracts, with university degrees and who are female. These factors not only potentially affect productivity growth but are also typical factors that potentially affect company or workplace preferences on collective bargaining structures (Askenazy et al., 2016; Forth et al., 2017; Schnabel et al., 2006). Although such an analysis is to some extent associational, the fact that estimates generally barely change when conditioning on these variables can be seen as suggestive evidence that any remaining selection bias is small (Altonji et al., 2005).

To some extent, this result is not surprising, as in many countries throughout the EU companies are simply unable to choose which bargaining system applies to them as the bargaining system that applies at the workplace level is exogenously given. The option of the company or workplace choosing the bargaining system exists in principle only in a limited number of countries such as for example Bulgaria, Cyprus, Germany, France, Italy, Portugal, Slovenia and Spain. However, even in these countries, companies are usually not completely free to choose their preferred system whenever and whatever they want as any change is often tied to strict regulations. The majority of bargaining systems are simply not 'disposable' for employers or trade unions to choose. For example, it is simply not possible for companies to choose between a coordinated or uncoordinated system of collective bargaining. Finally, in some countries, *erga omnes clauses* to extend collective agreements to other companies exist. These allow the extension of higher level agreements to companies not directly involved in their negotiation, such as

TABLE 2 Incidence of bargaining systems and labour productivity: Descriptive statistics

	Individual bargaining (%)	Company bargaining (%)	Higher level bargaining horizontally		Multilevel bargaining vertically		Labour productivity increased (%)
			Coordinated (%)	Uncoordinated (%)	Coordinated (%)	Uncoordinated (%)	
Austria	18	9	63	0	9	0	61
Belgium	20	13	52	0	0	15	49
Bulgaria	78	13	0	5	0	3	54
Croatia	49	24	0	21	0	6	52
Cyprus	51	28	0	11	0	9	56
Czech Republic	65	30	0	2	0	3	62
Denmark	23	18	40	0	19	0	67
Estonia	90	7	0	2	0	1	64
Finland	4	13	73	0	10	0	62
France	27	28	0	28	0	17	46
Germany	27	23	40	0	9	0	56
Greece	13	25	0	49	0	13	59
Hungary	76	16	0	5	0	3	53
Ireland	36	24	31	0	0	9	64
Italy	5	9	0	65	0	21	44
Latvia	81	14	0	4	0	1	62
Lithuania	83	13	0	2	0	2	59
Luxembourg	43	19	0	26	0	13	55
Malta	76	14	0	5	0	5	57
The Netherlands	26	24	41	0	9	0	59
Poland	54	37	0	7	0	2	61
Portugal	40	9	0	43	0	8	51

(Continues)

TABLE 2 (Continued)

	Individual bargaining (%)	Company bargaining (%)	Higher level bargaining horizontally		Multilevel bargaining vertically		Labour productivity increased (%)
			Coordinated (%)	Uncoordinated (%)	Coordinated (%)	Uncoordinated (%)	
Romania	28	61	0	7	0	5	67
Slovakia	39	31	0	25	0	5	60
Slovenia	41	33	14	0	0	12	61
Spain	8	19	0	61	0	12	45
Sweden	9	15	52	0	24	0	71
The United Kingdom	57	27	0	10	0	6	58

Note: Data source: ECS (Eurofound, 2010, 2015). Horizontally coordinated countries are Austria, Belgium, Denmark, Finland, Germany, the Netherlands and Sweden. Vertically coordinated countries are Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Sweden and Slovenia.

companies that are not members of the employers' organization that negotiated the agreement, and regardless of whether or not they want such an agreement. Clearly, companies in these countries do not have much of a choice but have to accept higher level collective agreements, and it is not possible to switch between systems depending upon actors' preferences, including productivity-enhancing preferences. Thus, the bargaining system, which applies (or not) to companies, is largely determined by various exogenous political and socio-economic factors (Crouch, 1993; Traxler et al., 2001).

Even though we can expect that collective bargaining systems are exogenously given for the majority of companies and workplaces in our sample, we need to consider that at some workplaces, decision makers do have the choice to select their preferred bargaining system depending upon various factors including productivity developments. This implies that a potential endogeneity problem exists, which needs to be addressed in our analysis (Ramaswamy & Rowthorn, 1993; Schnabel et al., 2006). The available data do not allow us to identify any actors' interests or preferences over time in order to be able to address the endogeneity problem but allow us to investigate different samples. This means that we are able to analyse countries in which we know that the collective bargaining system is exogenously given and a sample in which workplaces do have a choice. This means that we consider this potential endogeneity problem in our modelling strategy by pursuing additional robustness checks. Additionally, we test for the possibility that our estimates are influenced by specific countries by dropping each country in turn. Results are available in the online appendix and suggest that the estimates are robust to this type of jackknife resampling.

Another important modelling choice is the question of whether to include country fixed effects as an additional control. Importantly, although their inclusion would flexibly control for unobserved country differences, it would also mean that the estimates would only exploit the within-country variation in collective bargaining systems. This, however, seems undesirable in the context of the analysis here as some features of the collective bargaining system (i.e., coordination), as well as the industrial relations framework as such in which collective bargaining is embedded, vary between different countries but not within them. Including country fixed effects would thus mean that a large part of the effects of interest would be missed. Nevertheless, we test the robustness of our results by including a version of the model with country fixed effects.

In our analysis and discussion, we focus on the estimates of the pooled 2009 and 2013 waves of the ECS. Focusing on the pooled estimates can be thought of as an average effect of collective bargaining systems over two very different points in the business cycle, with 2009 being the tail end of the Great Recession following the financial crisis of 2008 and 2013 being well into a recovery period from this recession for most of Europe. These differences are potentially important as national features of collective bargaining systems, such as coordination, are typically stable over long periods of time and any statement about their performances needs to take into account their performance over different points of the business cycle. Thus, we concentrate on the long(er)-term effects of collective bargaining systems on changes in labour productivity.

Against the background that national collective bargaining systems have become increasingly perforated and heterogeneous in terms of the presence of different systems within countries, the question arises if the heterogeneity in different collective bargaining systems affects their effects. Therefore, we introduce in a separate model an additional indicator, that is, the Herfindahl index, which reflects the within-country variation of different collective bargaining systems.

Finally, as we argued that the effects of collective bargaining systems to changes in labour productivity might be mediated via workplace practices, we investigate to what extent collective bargaining systems relate to intermediate outcomes, such as in particular the importance of teamwork, changes in remuneration practices, workplace practices and working time. Although we do have to consider constraints in the availability of data on workplace practices and characteristics, we are able to consider the most important practices (e.g., Askenazy et al., 2016; Bloom et al., 2017; Bryson & Forth, 2015; Doucouliagos & Laroche, 2003; Wachsen & Blind, 2016; Willman, 1986) and therefore are certainly able to add credibility to our main estimates (Pearl, 2000).

Descriptive information is available on request. We have data on 42,957 workplaces from 28 countries, 20,727 of which were interviewed in 2009 and 22,230 in 2013.

5 | RESULTS

We begin our presentation and discussion by looking at the main results, which are presented in Table 3.

As explained earlier, we use a highly parsimonious model (i) that only includes our central explanatory variables, that is, the collective bargaining systems, and a model (ii) that includes a number of control variables in addition to our central explanatory variables. In model (iii), we also include country fixed effects even though, as explained earlier, their inclusion is problematic for methodological reasons. We only consider estimates to be robust and reliable if the significance is confirmed in the first two main models. As can be seen in Table 3, the inclusion of control variables affects the size and significance of some collective bargaining systems. Although we find no substantial change between models (i), (ii) and (iii) for horizontal coordinated higher level bargaining and vertically coordinated multilevel bargaining, we find some differences for the other categories. However, in the two main models (i) and (ii), also the effect of horizontal uncoordinated higher level bargaining is robust.

More specifically and by also looking at the direction of the relationship, these results suggest that horizontally uncoordinated higher level collective bargaining is associated with an inferior performance, that is, the likelihood of workplaces having productivity increases that fall under such a uncoordinated higher level collective agreements is significantly lower than with workplaces in which no collective agreement exists. However, the results also show that the likelihood of productivity increases is significantly (and robustly) higher for workplaces, which fall under a collective agreement, which is based on vertically coordinated collective bargaining. Thus, vertically coordinated collective bargaining is robustly associated with a beneficial productivity performance.

As explained earlier, we investigate the relationship between collective bargaining systems and changes in labour productivity further. In model (iv), we present the estimates by introducing the Herfindahl index as a measure of the concentration, that is, homogeneity, of national collective bargaining systems. As can be seen in Table 3, we find that these results do not differ substantially from those in model (ii). On the one hand, this shows that the estimated of horizontally uncoordinated higher level bargaining and vertically coordinated bargaining are (still) the only variables that are robustly significant, and on the other hand, it shows that the degree of perforation, that is, the heterogeneity/homogeneity, of national collective bargaining systems does not seem to matter for increases in workplaces' labour productivity.

TABLE 3 The effects of collective bargaining systems on increases in labour productivity

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Company bargaining	0.025** (0.011)	0.009 (0.011)	0.014** (0.006)	0.012 (0.009)	0.036*** (0.012)	0.025** (0.012)
Horizontally coordinated higher level bargaining	0.032 (0.021)	0.028 (0.021)	0.004 (0.009)	0.032 (0.021)	0.028 (0.022)	0.031 (0.026)
Horizontally uncoordinated higher level bargaining	-0.078*** (0.024)	-0.084*** (0.022)	-0.008 (0.008)	-0.081*** (0.024)	-0.015 (0.018)	-0.091*** (0.020)
Vertically coordinated multilevel bargaining	0.111*** (0.037)	0.095*** (0.032)	0.036** (0.015)	0.100*** (0.033)	0.117*** (0.030)	0.116*** (0.042)
Vertically uncoordinated multilevel bargaining	-0.027 (0.017)	-0.052*** (0.020)	0.014 (0.011)	-0.047** (0.021)	0.001 (0.025)	-0.032* (0.017)
Herfindahl index	0.055 (0.081)					
Controls	No	Yes	Yes	Yes	Yes	Yes
Observations	42,957	42,957	42,957	42,957	29,930	39,428
Pseudo R ²	0.0287	0.0419	0.0526	0.0420	0.0341	0.0431

Note: Individual bargaining is used as the omitted benchmark category for collective wage bargaining systems. Model (iii) includes in addition to the control variables from (ii) also country fixed effects. Models (v) and (vi) are based on (ii) but include different country sets. Data source: ECS (Eurofound, 2010, 2015). Average marginal effects and cluster-robust standard errors in parentheses.

*Statistically significant at 10% level.

**Statistically significant at 5% level.

***Statistically significant at 1% level.

Against the background that in some countries it is possible that workplaces are able to choose their 'preferred' collective bargaining system and therefore endogeneity concerns in our estimation strategy (potentially) need to be addressed, we present the estimation results on the basis of two different samples of countries. Although the estimation of model (v) is based on a country sample where the collective bargaining system is exogenously given, the estimation in model (vi) is based on a country sample where there were no changes to the predominant level and degree of coordination in the bargaining systems between the two waves of the ECS. As can be seen in models (v) and (vi), we find a beneficial performance for company bargaining and vertically coordinated bargaining in both models and a negative performance of horizontally uncoordinated higher level bargaining and vertically uncoordinated multilevel bargaining. However, by comparing these results with the other models, only the beneficial effect of vertically coordinated multilevel bargaining can be confirmed to be robustly associated with a beneficial performance. In sum, the estimation results also show that the endogeneity issue is not very problematic because the estimation results between the two samples do not differ substantially.

Finally, in Table 4, we present the results on the association between the collective bargaining systems and the intermediate outcomes in the causal link to changes in labour productivity. We generally find a number of positive and negative effects of our collective bargaining systems on intermediate outcomes such as the importance of teamwork as well as changes in remuneration, working and working time practices. Without going into details about the effect for each intermediate outcome, we find support for the thesis that collective bargaining systems are linked with changes in the production function that is, disembodied technical change. Furthermore, our results support the argumentation (Bloom et al., 2017; Wachsen & Blind, 2016) that labour market restrictions that are imposed by standardized wages and working conditions in encompassing collective agreements do not necessarily lead to

TABLE 4 The effects of collective bargaining systems on intermediate outcomes

	Teamwork important	Changes to [...] in last years		
		Remuneration practices	Working practices	Working time
Company bargaining	0.014 (0.014)	−0.011 (0.016)	0.027** (0.013)	0.034*** (0.009)
Horizontally coordinated higher level bargaining	0.040** (0.020)	−0.095** (0.037)	0.066** (0.028)	0.050*** (0.015)
Horizontally uncoordinated higher level bargaining	−0.020 (0.024)	−0.068** (0.028)	0.013 (0.017)	0.035** (0.015)
Vertically coordinated multilevel bargaining	0.054** (0.022)	−0.013 (0.038)	0.148*** (0.052)	0.096*** (0.024)
Vertically uncoordinated multilevel bargaining	0.000 (0.026)	−0.040 (0.032)	0.054* (0.028)	0.066*** (0.019)
Observations	42,957	42,957	42,957	42,957
Pseudo R^2	0.0412	0.0156	0.0162	0.0215

Note: For sources and estimation strategy, see notes in Table 3.

*Statistically significant at 10% level.

**Statistically significant at 5% level.

***Statistically significant at 1% level.

economic inefficiencies (Hirsch & Link, 1984) but instead encourage changes in the production function, which have long(er)-term beneficial effects.

6 | DISCUSSION

The core of our hypothesis was that we associated for both horizontal and vertical coordinated collective bargaining systems a beneficial performance. However, we further hypothesized that the beneficial effect is highest for vertically coordinated bargaining as it opens an additional way that lows to tackle workplace specific demands that integrates the mutual interest of the wider domain. In light of these hypotheses, the results of our analysis mean that we can only accept the hypothesis on the superior performance of vertically coordinated but not horizontally coordinated collective bargaining systems. However, the hypothesis that vertically coordinated bargaining to be associated with the highest performance can also be accepted.

Although the results of this study correspond with recent studies and evidences from macrolevel analyses (Brandl, 2012; Johnston, 2016; OECD, 2019), they also challenge fundamental theoretical hypotheses for various reasons. Most notably, the prominent hump-shape thesis by Calmfors and Driffill (1988) is challenged because it argues that higher level, that is, sector-level, collective bargaining systems are associated with an inferior performance and company-level bargaining with beneficial effects. This theoretical reasoning must be reconsidered for two reasons: first, because company bargaining is not found to be robustly associated with a high performance, and second, that higher level bargaining systems can perform best if bargaining is coordinated. Hence, our results on the performance of coordinated collective bargaining systems are generally consistent with macrolevel reasoning such as from Soskice (1990) and Traxler (1995). This also implies that if linked with the macrolevel, that is, country level, our results support the findings by Brandl (2012), Johnston (2016), OECD (2019), Soskice (1990) and Traxler (1995) that collective bargaining systems that exist in countries such as Austria, Germany, the Netherlands and all Nordic countries affect productivity developments positively, whereas in other countries, such as in some Mediterranean countries and in liberal countries such as in the United Kingdom, the enhancing performance effect is absent or even negative.

Our results also amends the theoretical reasoning that multilevel systems are associated with the worst performance of all bargaining systems (Boeri, 2014) as our results show that the performance of multilevel collective bargaining systems is dependent upon the coordination of bargaining units between the levels. Indeed, our results suggest that coordination is the key element for the efficacy of collective bargaining systems and thus for the performance and therefore are in line with other recent studies that are based on alternative operationalization's and conceptualizations of coordination such as OECD (2019). On the one hand, the results here show that multilevel bargaining systems under no coordination are associated with a weak and, under certain conditions, even a negative performance. The latter effect might be explained by the fact that they combine all the disadvantages of possible sector cartelizing effects and free-riding incentives of bargaining units if loopholes from higher level agreements exist. On the other hand, the results show that if multilevel systems are coordinated, they have the potential to systematically outperform other bargaining systems. In that way, they incorporate the need to internalize the costs and benefits of their outcomes as well as enable bargaining units at different levels to adapt and adjust bargaining outcomes in a flexible way to unit and domain-specific circumstances. Without being able to provide a full overview of such unit and

domain-specific circumstances and regulations within collective bargaining systems, short-time working schemes are certainly one of the best known and most effective with respect to their ability to increase companies' productivity (Möller, 2010).

7 | CONCLUSION

These results of the study provide evidence on the success of past and current policy recommendations provided by policy making institutions and authorities in the context of current attempts to reform collective bargaining. Most notably, this applies to recommendations under the umbrella of the European Commission's new economic governance and the Europe 2020 strategy, as well as to policy recommendations given by international organizations such as the IMF (IMF, 2015) or the OECD (OECD, 2018). Even though previous studies only allowed international organizations to make fairly ambiguous recommendations, nearly all policy recommendations in this context were geared towards fostering and strengthening company collective bargaining and individual bargaining (Koukiadaki & Grimshaw, 2016; Marginson, 2015). These recommendations led to the disappearance of any forms and structures of sectoral and national collective bargaining for a number of countries in Central and Eastern Europe. In a number of other countries, especially in Southern Europe, this policy advice leads to increased decentralization and the introduction or strengthening of supplementary levels of collective bargaining.

However, both developments are 'suboptimal' in the light of the results presented here. In the case of the abolishment of any sectoral and national agreements, the performance that is 'achievable' by these reforms is only 'average' when compared with other possible reforms, as company bargaining and individual bargaining are clearly outperformed by vertically coordinated multilevel collective bargaining systems. When collective bargaining is reformed towards a multilevel system in which, for example, sectoral bargaining is widened and complemented by company bargaining, the performance of the reform depends upon the ability of units to interact in an integrative way. On the one hand, if the reform leads to an uncoordinated multilevel bargaining system, the performance of this system might be even worse. On the other hand, if the reform is flanked by coordination mechanisms, the reform is likely to succeed in a first best solution.

This study provides the most comprehensive analysis of the effects of current systems of collective bargaining in the EU on the basis of the most generalizable available data set. This allows us to highlight further informed options for policy making. Given that past reforms and transformations of collective bargaining systems in the EU were predominantly geared towards the strengthening of company bargaining, without any attention to the coordination of collective bargaining, our analysis suggests that past reforms and current recommendations and reforms have resulted in a second best solution, or sometimes even a dampening effect on performance. Against this background, policy makers should pay more attention to the effects and performance of coordinated systems of collective bargaining in order to support economic competitiveness and productivity growth in the EU, which is likely to become a major policy goal in order to address the effects of the COVID-19 crisis.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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